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The Files

29 August 1956

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Non-conventional Power Sources - Trip Report.

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1. An initial visit was made to the [redacted] on 23 August 1956 to monitor Power Sources development activity under [redacted] Task Order 2. Present were:

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2. Thermoelectric Generator - Work at the present time appears to be concentrated in the thermocouple area by both [redacted]. That this is so is attributed in part to our indorsement of a [redacted] thermocouple power source proposed by the contractor and the availability of [redacted] (a recognized authority on thermocouples). Breadboard fabrication of models is accomplished simultaneously with the progressive advance of theoretical considerations. The initial design considers an 8 inch diameter [redacted] capable of converting 1000 watts of thermal energy to 25 watts of electrical energy for an efficiency of 2.5%. The double bottom of the [redacted] 6 cm in depth, is packed with graphite to simulate both weight and thermal conductivity of the thermocouples. Dr. [redacted] is basing the design on a hot junction of 350 degrees C and a cold junction of 100 degrees C. The undersigned indorsed the idea of breadboard fabrication to establish each theoretical consideration because neither ERA nor MIT in similar design efforts found that theoretical efficiencies could not be approached in practice. [redacted] has fabricated three engineering units to establish heat transfer characteristics and temperatures obtainable over various fires to include charcoal and wood in field tests outside the laboratory. The next and final phase of the study will be experimentation with thermocouples installed. The present plan is to use 200 couples in series to provide 5 amps at 5 volts. The breadboard for this study will be units having a rectangular form factor to simplify the thermocouple layout.

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25X1A5A1 [] plans on using conventional Antimony-Constantan thermocouples while ERA's study considered an Alloy 1083 (developed by them) and Constantan as the most suitable. Detailed data on Alloy 1083 is being made available to [] feels that mica insulation of the thermocouples at the hot and cool surfaces will result in a 200 degrees C temperature differential at the junction. Should breadboard tests confirm the above, hardware might be obtainable in the not too distant future. With respect to inquiries regarding the use of silicon semiconductors as the thermocouple (lower heat transfer characteristics with consequent greater temperature differential and higher voltage gradient) the Contractor said he would continue his search for a better thermocouple.

3. Fuel Cell - []

25X1A5A1 [] during the period 16 - 17 August 1956 to inquire into power sources development by the SigC. The Hydrogen fuel cell was discussed with []

25X1A5A1 [] contributed to the invention of the hydrogen fuel cell. [] could only conclude that [] were somewhat discouraged by the present hazards and need for supplementary accessories of a hydrogen fuel cell. Opening the hydrogen valve to energize the cell prior to the execution of other preliminary steps would result in an explosion. The KOH (potassium hydroxide) electrolyte must be highly concentrated. [] expressed the belief that [] will attend an electro chemists convention in Cleveland this fall and that new information will be made available at that time.

4. Solid Electrolyte Cell - [] said that their discussions of a silver bromine cell with the SigC people only received luke warm reaction. Inquiries into low temperature capabilities indicate that such a cell would result in a 25% to 50% energy loss with operation below room temperature.

25X1A5A1 5. Atomic Power Source - [] advised of a new NUCLEAR power source mentioned in their monthly report (not yet received). This reference deals with Polonium 210, the first radio active material discovered by Curie. Po 210, sometimes called Radium F, is extremely rare but can be manufactured in a reactor. [] associates the use of Po 210 in conjunction with thermocouples as the possible power source claimed by the Russians as capable of powering automobiles etc.

25X1A5A1 6. Improved DEAC NiCd cell - [] has evaluated a new and improved DEAC nickel-cadmium cell which has twice the capacity/cubic volume as a comparable Gould cell.

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	Gould	DEAC
voltage	1.25	1.25
capacity	100 ma	225 ma
weight	10 grams	12 grams
internal R	.11 ohms	.65 ohms
Short Circuit current	11 amps	1.9 amps

The company agrees to make the complete evaluation report available as an attachment to their quarterly report.

7. ASTIA reports - The company reported that they had been unsuccessful in obtaining ASTIA reports since they could not reveal a contract number to ASTIA. The undersigned agreed to get any ASTIA reports desired on a loan basis if the company would provide a list of "AD" numbers. (The company receives 35 copies of the monthly information index).

8. Other Reports - The company seeks other unclassified reports available through the Department of Commerce. The company was requested to communicate directly with the Department of Commerce for such reports and ask this office to intervene only when the reports were not available due to classification.

25X1A5A1 9. London Reports - is obtaining 8 translations summarizing Russian literature on work in the field of thermoelectricity from Infosearch, 16 Ladbroke Gardens, London W11, England at a cost of \$36.00. Dr. van der
25X1A5A1 suggested subscribing to this report at a cost of about \$300 per year. It was suggested that we make such a determination after a review of the initial reports.

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OC-E/R&D-EP/CEM:mjr (29 August 1956)

cc: R&D Subject File
Monthly Report
O&T
Lab
Dev-sp

*(Thermocouple approach again
attractive due to lower power
requirements for transmission
year -)*

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